summer a black bulb thermometer was exposed to the rays of the sun; during the winter frequent observations were made with exposed and covered minimum thermometers to ascertain the nightly radiation at low temperatures. In both winters February was the coldest month, while January both times showed a rise in the temperature when compared either with December or February. In winter the temperature was highly variable, and sudden rises or falls were frequent; in the three summer months, however, the temperature was very constant, and changes very rare. July was the warmest month. The lowest reading was − 37½° R. (nearly − 47° C.) The influence of extremely low temperatures upon the human body has often been exaggerated; there are tales of difficulty in breathing, pains in the breast, &c., that are caused by them. Lieut. Weyprecht and his party did not notice anything of the kind; and although many of them had been born in southern climes, they all bore the cold very easily indeed; there were sailors amongst them who never had fur coats on their bodies. Even in the greatest cold they all smoked their cigars in the open air. The cold only gets unbearable when wind is united to it, and this always raises the temperature. Altogether, the impression cold makes upon the body differs widely according to personal disposition and the quantity of moisture contained in the air; the same degree of frost produces a very uncomfortable effect at one time, while at another one does not feel it.

To determine the quantity of moisture in the atmosphere, an ordinary psychrometer, a dry and a wet thermometer, were used. But the observations with these instruments are not reliable at low temperatures, and had to be given up altogether during winter, as the smallest errors give great differences in the absolute quantity of moisture in the air. In order to determine approximately the evaporation of ice during winter, Lieut. Weyprecht exposed cubes of ice that had been carefully weighed to the open air, and determined the loss of their weight every fourteen days.

(*To be continued.*)

PRIZES OFFERED BY THE BELGIAN ACADEMY

THE following subjects for prizes to be awarded in 1866 have been proposed by the Royal Academy of Sciences, Belgium:—

1. To improve in some important point, either in its principles or applications, the theory of the functions of imaginary variables.

2. A complete discussion of the question of the temperature of space, based upon experiments, observations, and calculation, stating the grounds for the choice made between the different temperatures attributed to it.

Competitors should observe that the above question, stated in the most general terms, is connected with the knowledge of the absolute zero, definitely fixed at − 272°·85 C., but that a historical and analytical inquiry into researches undertaken, previous to about 1820, to resolve this question, would offer a real scientific interest. Particular attention is called to the works of the end of the eighteenth century and the commencement of the nineteenth; among others, those of Black, Irvine, Crawford, Gadolin, Kirwan, Lavoisier, Lavoisier and Laplace, Dalton, Desormes and Clément, Gay-Lussac, &c. Note also the temperature, − 160° C., which Person indicates; according to his formula, which connects the latent heat of fusion with specific heats, this number would represent the absolute zero. As it comes near to that given by Pouillet, it will be important to discover what is its signification, its import (*sens*), or its exact physical value.

3. A complete study, theoretical and, if necessary, experimental, of the specific absolute heat of simple and of compound bodies.

4. New experiments on uric acid and its derivatives, chiefly from the point of view of their chemical structure and their syntheses.

5. New researches into the formation, the constitution, and the composition of chlorophyll, and into the physiological *rôle* of that substance.

6. To expound the comparative anatomy of the urinary apparatus in the vertebrates, basing it on new organogenic and histological researches.

The prize for the first, the fourth, and the sixth questions will be a gold medal of the value of 800 francs, the prize for the fifth will be of the value of 600 francs, and the prize for the second and third questions will be of the value of 1,000 francs.

The memoirs must be legibly written, either in French, Flemish, or Latin. They should be addressed, carriage-paid, to M. J. Liagre, Perpetual Secretary of the Academy, at the Museum, before August 1876; any received after which will be out of the competition.

Authors must not put their names to their works. Only a motto must be attached, and the same written outside an envelope enclosing the author's name and address. This condition is indispensable.

SOCIETIES AND ACADEMIES

LONDON

Mathematical Society, March 11.—Prof. H. J. S. Smith, F.R.S., president, in the chair.—Mr. Roberts gave an account of his paper on a simplified method of obtaining the order of algebraical conditions.—Prof. Sylvester, F.R.S., then spoke on "an orthogonal web of jointed rods, a mechanical paradox." If two sets of points be taken respectively in two lines perpendicular to each other, either in a plane or in space, and a *linkage* be formed by connecting each point in one set with each point in the other by jointed rods, this constitutes what the author means by an orthogonal web. It is *not* a fixture, and its motion is subject to this curious condition, that either each set of points must always continue to lie in the same right line, which may be called a neutral position, or else one set will lie in a right line and the other in a plane at right angles to such line. Starting from the neutral position (or position of *double-lock*), the system may be said to be subject to an optional locking about one or the other of the two perpendicular lines, and an unlocking about the other, but when once put in motion the system must be again brought into the same or a new neutral position before the one axis of lock can be got rid of, and another at right angles thereto substituted in its stead. If the whole motion be confined to a plane, the paradox consists in the link-combination possessing one degree of liberty of deformation (*αλλοιωσις* as distinguished after Plato from *κινησις*), although a calculation of the amount of restraint by the general method applicable to such questions would seem to indicate that it *ought* to form an absolutely rigid system except in the case where there are only two joints in one at least of the two sets. Taken in space there is the further and more striking paradox that the number of degrees of liberty of deformation according to the choice made of one or the other of the two sets of points to be unlocked out of the rectilinear into the planar position will be the *alternative* of two numbers, viz. the number of joints in the one set or in the other set (which need not be the same), a kind of indeterminateness in the "index of freedom" without precedent in kinematical speculations. As lightning clears the air of impalpable noxious vapours, so an incisive paradox frees the human intelligence from the lethargic influence of latent and unsuspected erroneous assumptions. Paradox is the slayer of prejudice.—The Secretary, in the author's absence, then read a portion of Mr. G. H. Darwin's paper on some proposed forms of slide-rule. The object of the author was to devise a form of slide-rule which should be small enough for the pocket and yet be a powerful instrument. The first proposed form was to have a pair of watch-spring tapes graduated logarithmically, and coiled on spring bobbins side by side. There was to be an arrangement for clipping the tapes together, and unwinding them simultaneously. Two modifications of this kind were given. The second form was explained as the logarithmic graduation of several coils of a helix engraved on a brass cylinder. On the brass cylinder was to fit a glass one, similarly graduated. To avoid the parallax due to the elevation of the glass above the other scale, the author proposed that the glass cylinder might be replaced by a metal corkscrew sliding in a deep worm, by which means the two scales might be brought flush with one another.

Anthropological Institute, March 9.—Col. A. Lane Fox, president, in the chair.—Sir Duncan Gibb read a paper on Ultra Centenarian Longevity, in which he exhibited some tables giving eighty-four instances of the reputed age of 107 to 175 years, a certain proportion of which he considered he had grounds to believe to be correct. Of nine living centenarians whom he had previously examined for physiological purposes, he now added a tenth—the Tring centenarian—who died recently in her 112th year. The correctness of her age was considered in an exhaustive manner, and the reasons were given to justify this conclusion. Mainly they consisted of the discovery of the register of her baptism at Chinnor, Oxford, in 1763, from information furnished by herself; the birth of her first child Samuel, when she was between twenty-nine and thirty; the drowning of him and some thirty-four other persons by a catastrophe at Hadlow in 1853, when his age was stated to be fifty-nine on his monument; and the calculation of dates and other circumstances in the old dame's family history. The proofs were altogether on the side of certainty, whilst any objections that could be brought forward were of the feeblest character, especially such as the inability to find a register of the marriage with her husband, who was a soldier in the Bucks Militia. Her physical condition, from careful examination during life in October 1873, was next described, when all the organs and functions of the body were, for the most part, found to be healthy, and corresponded to those of a person a fifth of her age. All that was confirmed in every respect by inspection after her death in January last, and the results proved the absence of the usual well-known senile changes, which explained the fact, as the author stated, that not only she, but the nine other persons he had examined, were enabled to reach the age of 100 years, and even to overstep it. Yet, with the attainment of such a great age, there was always an amount of feebleness present which very slight causes influenced, and thus life soon came to an end. In the old dame the merest chill or slightest possible cold extinguished the spark of life. The occurrence of a well-authenticated case like hers readily explained the fact that now and then, under peculiarly favourable circumstances, especially in a more equable climate than our own, the century is exceeded by several decades. And the occurrence of such great ages as have been recorded from time to time by honest and conscientious inquirers of former years, need not be looked upon with doubt, much less with distrust, for the anxiety to prove the correctness of such ages was as great then as it is now.—Previous to the ordinary meeting, a special general meeting of the members was held to authorise an application to the Board of Trade for a license, and to adopt the draft memorandum and articles of association for the incorporation of the Institute. It was also resolved that ladies be admitted as members with all the usual privileges.

Royal Horticultural Society, Feb. 17.—Scientific Committee.—Mr. A. Murray, F.L.S., in the chair.—Dr. Masters showed fruit of *Fuchsia procumbens*. The Rev. M. J. Berkeley exhibited leaves of *Thea Bohea*, from the Natal Botanic Garden, affected with a lichen, *Strigula Feei*, Mont. Mr. Keit, the curator, states that it makes its appearance as a minute speck of brown colour which gradually enlarges in circumference till the end of the season, when the margin assumes a pale green colour, and ceases to grow. Mr. Berkeley found that the brown substance was composed of a species of *Cephaleuros;* it consisted of decumbent articulated threads, each of which has at its tip a globose sporangium. It is very near *Chroolepus*, and if some lichens are parasitic on *Chroolepus*, this may be on *Cephaleuros*.—Prof. Thiselton Dyer exhibited specimens of *Baridius aterrimus*, an insect most destructive to orchids at Singapore. He also called attention to the occasional formation of tubers within potatoes, which he believed to be due to ingrowing shoots derived from the eyes.—A portion of a letter from Santarem, addressed by Mr. Trail to Dr. Hooker, was read, describing the ant-inhabited bullæ on the leaves of some *Melastomaceæ*. After careful examinations Mr. Trail was quite at a loss to determine the exact connection between the bullæ and the ants, of which at least three species inhabit them.

General Meeting.—W. Burnley Hume in the chair.—The Rev. M. J. Berkeley remarked that he had placed some very old specimens of *Micrococcus prodigiosus* (blood rain) on rice paste, and they had recommenced growing, and had spread as far as could be expected from the state of the weather. According to Mr. Stephens, the plant retains its power of vegetation after it has been in an oven forty-eight hours.

March 3.—Scientific Committee.—Dr. Hooker, C.B., P.R.S., in the chair.—The Rev. M. J. Berkeley read a letter from Mr. Moseley, the naturalist on board the *Challenger*, relating to a fungus, *Sphæria sinensis*, growing out of a caterpillar and used as a delicacy by the Chinese.—Prof. Thiselton Dyer showed a ball formed by the action of the sea out of fragments of *Caulinia* from the shore at Mentone, collected by the late Mr. Moggridge.—A discussion arose as to the effect of lichens on trees in connection with the occurrence of species of *Strigula* on the leaves of the tea plant, and the injury which is found to arise in mossing the stems of *Cinchona* in India after removing the bark, if lichens are mixed with the moss. The Rev. M. J. Berkeley thought that all the evidence was against any penetration of the hyphæ of the lichen into the subjacent tissues of the plant upon which the lichen grew. The lichens were injurious by preventing the access of light and air. If they were scraped off the branches of apple-trees infested by them, and the surface were washed, the tree soon recovered, which would not be the case if the hyphæ had penetrated into its tissues.—Dr. Bastian said that he had examined some of the nematoid worms found in the swellings on the roots of cucumbers. They were, however, too immature to determine their genus.—Dr. Masters alluded to a Chinese primrose exhibited, in which there was a partition throughout the leaves, stem, and inflorescence of colour. He thought that this was an instance of dissociation of hybrid characters. A similar bilateral partition of colour sometimes took place in plants raised from cuttings, when of course the above explanation would not apply.

General Meeting.—Bonamy Dobree, treasurer, in the chair.—The Rev. M. J. Berkeley addressed the meeting. He called attention to the gigantic Sweet Potato (weighing over 15 lbs.), *Convolvulus Batatas*, from Madeira, shown by Dr. Hooker; a branch of the Kumquat, *Citrus japonica*, with fifty-six fruits; and a charming miniature Orchid, *Masdevallia melanopus*.

Physical Society, Feb. 27.—Prof. Gladstone in the chair.—Mr. Wills, F.C.S., submitted to the Society apparatus which he had devised for exhibiting the sodium spectrum to an audience. The experiment as usually shown consists in volatilising the metal or one of its salts between the carbon poles of a lamp and in projecting the spectrum on to a screen. The method is imperfect, as the characteristic lines of sodium are always associated with the continuous spectrum of the electric light. Mr. Wills prefers, therefore, to obtain a sodium flame by burning hydrogen which has been passed over the surface of the molten metal; by this means a pure sodium spectrum may be thrown on the screen. Prof. McLeod suggested that other metals might be introduced into the hydrogen flame in a finely-divided state, and that the continuous spectrum might be eliminated by employing a horizontal slit.—Prof. G. C. Foster then read a paper, by himself and Mr. J. O. Lodge, on the lines of flow and equipotential lines in a uniform conducting sheet. The first experimenter who worked on this subject was Kirchhoff, who used plates of copper, but owing to their small dimensions, his measurements were imperfect. Quincke employed rectangular plates, and afterwards discs of lead and copper conjointly, so that he obtained a difference of potential at the junction. The next experiments were made by Prof. Robertson Smith, who used conducting discs of tinfoil and deduced equipotential lines from the lines of flow. Prof. Foster stated that the general mathematical theory had been fully established by Kirchhoff, who had verified it experimentally in all its main features. The object the authors of this paper had in view was to show that Kirchhoff's results can be arrived at by very simple mathematical processes, if each electrode by which electricity is supplied to or taken from the sheet be regarded as producing everywhere the same effect as it would if it were the only electrode in the sheet. The electrical condition of every point in the sheet thus appears to result from the simple superposition of the effects due to the several electrodes. This mode of treating the question has been adopted by Prof. Robertson Smith, but his paper was in the main addressed to mathematical readers. It was the aim of the authors, however, to show that the chief results could be established by elementary methods which can be included in ordinary class teaching. The paper contained, in addition to the mathematical discussion of the subject, a description of an experimental method of laying down the equipotential lines on a conducting surface, so that the difference of potential between any two consecutive lines may be constant. Measurements were also given of the resistance of discs of tinfoil of various sizes, and with the electrodes in various positions. The results agreed closely with the calculated values, and thus supplied a verification of the theory which Kirchhoff had been unable to obtain in consequence of the small resistance of the discs used by him. Mr. Latimer Clark made some observations on the methods by which contact was made between the electrodes and the conducting sheet, and Prof. Adams then described some of the results which he had just communicated to the Royal Society, on lines of force.

Entomological Society, March 1.—Sir Sidney Smith Saunders, president, in the chair.—Mr. F. H. Ward exhibited living specimens of a *Lepisma*, allied to *L. saccharina*, which he had not previously observed in this country. They were found in a bakehouse near London, in the brickwork of the oven and other warm parts of the buildings. Mr. M'Lachlan suggested that they might have been introduced with American flour, as Mr. Packard had recently published an account of a species closely allied to *L. saccharina*, which he thought might probably be found identical with the present species.—Mr. Ward also exhibited microscopic slides showing the sexes of the Chigoe, and portions of the human skin with the insect attached.—Mr. Champion exhibited larvæ of *Empusa pauperata* from Corfu.—A note was received from Mr. W. C. Boyd with reference to some fleas exhibited at the last meeting. He stated that fleas were frequently found in the inside (not the outside) of the ears of wild rabbits, especially about this time of year; and that his brother had seen a rabbit which must have had three hundred fleas in the two ears. He believed the rabbits were not much troubled by the presence of the parasites, as he had never noticed any inflammation, however many fleas there might have been.—The Rev. Mr. Gorham communicated a paper containing descriptions of eighteen new species of *Endomycici*, from various tropical countries.—Mr. Dunning directed attention to an interesting paper by Dr. Leconte, on entomological nomenclature and generic types, which appeared in the December part of the *Canadian Entomologist*.

EDINBURGH

Royal Society, March 15.—David Milne Home, LL.D., vice-president, in the chair.—The Council having awarded the Makdougall Brisbane Prize for the Biennial Period 1872-74 to Prof. Lister, for his paper on the germ theory of putrefaction and other fermentative changes, the medal was presented to him by the chairman, after a discourse by Dr. Crum-Brown upon the nature and merits of Prof. Lister's investigation.—The Council have awarded the Neill Prize for the Triennial Period 1871-74 to Mr. Charles William Peach, for his contributions to Scottish zoology and geology, and for his recent contributions to fossil botany.—The following communications were read:—On the diurnal oscillations of the barometer, by Alex. Buchan, M.A.; on phenomena connected with the subject of single and double vision, as shown by the stereoscope, by Robert S. Wyld; on products of oxidation of methyl-thetine, by Prof. Crum-Brown and Dr. Letts.

CAMBRIDGE

Philosophical Society, Feb. 22.—A communication was made by the Rev. O. Fisher, upon the formation of mountains on the hypothesis of a liquid substratum. This paper was a sequel to one read in December 1873, in which it had been shown that, upon the supposition that the inequalities of the earth's surface have been formed by contraction of its volume through cooling, they are too great to be so accounted for if the earth has cooled as a *solid* body. In the present communication it was therefore assumed that there is a *liquid* layer beneath the cooled crust; and an approximate calculation was made of the form which the corrugations of a flexible crust would take if so supported. It was shown that their lower surface would consist of a series of equal circular arcs arranged in a festoon-like manner, and having a radius $2\frac{\rho}{\sigma}c$, where ρ, σ are the densities of the crust and liquid respectively, and c the thickness of the crust. It was argued that the consequences of this form of corrugation agree fairly well with some of the phenomena of mountain elevation, but that it does not suffice to explain the ocean-basins and the continental plateaux.

GLASGOW

Geological Society, Feb. 11.—Annual Meeting.—The president, Sir William Thomson, LL.D., F.R.S., delivered an address on Underground Temperature. Sir William explained at the outset that the mathematical theory of underground temperature involved phenomena which might be divided into two classes—periodic and non-periodic. The periodic phenomena occurred over and over again with perfect regularity in successively equal intervals of time; the non-periodic might be approximately periodic, or irregularly periodic, without strictly fulfilling that definition. But, on the other hand, the action which had no periodic character whatever might be irregular, or there might be a gradual secular variation. There might thus be three classes of phenomena—secular variation, irregular variation, and periodic variation. He then described the mathematical theory of Fourier, as applied to periodic variations, observing in passing that it was equally convenient for dealing with all the three classes. That theory was one of the most beautiful pieces of application of the mathematical instrument which they had in the whole history of science. It constituted a new branch of mathematics, and was invented by Fourier for the purpose of analysing the phenomena of the conduction of heat through solids. He exhibited a diagram showing the results obtained by Forbes from thermometers placed at depths of three, six, twelve, and twenty-four feet below the surface in Craigleith Quarry, the Experimental Gardens, and the Calton Hill, Edinburgh. The results of these observations which Forbes commenced, and Sir William continued for seventeen years, showed that the variations were greater nearer the surface, that a higher temperature was generally indicated at a later period at the greater depth, and seemed to show also that the sandstone of the Craigleith quarries had a greater conductivity than the trap-rock. Sir William concluded by referring to the temperature of the earth as indicating its former condition, and promised at some future time to treat this subject at greater length before the Society.

DUBLIN

Royal Geological Society, Feb. 11.—Prof. Hull, F.R.S., president, occupied the chair, and delivered the anniversary address, in the course of which he pointed out some subjects where investigation on the part of members of the society seemed desirable. One of these was cave explorations in Ireland, an investigation which had been pursued with very great success in England and France, and along the shores and islands of the Mediterranean. Prof. Hull mentioned a number of interesting discoveries of animal and other remains that had been made in the caves of Ireland, which he said furnished proofs of the wide field of research that was open to them. Another subject which he recommended to the consideration of the members was the microscopic examination of rocks, and he hoped that the many curious rock-formations to be found throughout Ireland would be studied and reported upon by those who felt an interest in the matter.—Sir Robert Kane, F.R.S., was elected president for the year.

BOOKS AND PAMPHLETS RECEIVED

BRITISH.—Consumption and Tuberculosis; their Proximate Cause and Specific Treatment by the Hypophosphites: John Francis Churchill, M.D., Paris (Longmans).—Problems of Life and Mind. Vol. ii.: George Henry Lewes (Trübner).—The Marine Invertebrates and Fishes of St. Andrews: W. C. M'Intosh, M.D., F.R.S.E., C.M.Z.S., &c. (A. and C. Black, and Taylor and Francis).—A Whaling Cruise to Baffin's Bay. 2nd edit.: Capt. A. H. Markham (Sampson Low and Co.)—Facts about Breadstuffs (Porteous).—Astronomy; by J. Rambosson. Translated by C. B. Pitman (Chapman and Hall).—Ornithology and Conchology of the County of Dorset: J. C. M.P.—Proceedings of the Royal Society of Edinburgh, 1873-74.—Instructions for the Observation of Phenological Phenomena. Prepared by request of the Council of the Meteorological Society (Williams and Strahan).—Catalogue of the Library of the Manchester Geological Society. Edited by John Plant, F.G.S.

AMERICAN.—Principles of Chemistry, and Dr. Hinrich's Molecular Mechanics (Davenport, Iowa, U.S.)—Annual Report upon the Survey of Northern and North-Western Lakes in charge of C. B. Comstock (Washington).—Bulletin of the United States Geological and Geographical Survey of the Territories: 2nd series, No. 1 (Washington).

CONTENTS

PAGE
SCIENTIFIC SURVEYS 381
THE COUNTESS OF CHINCHON 383
GERLAND'S "ANTHROPOLOGICAL CONTRIBUTIONS" 384
OUR BOOK SHELF:—
  Hartwig's "Aërial World" 385
LETTERS TO THE EDITOR:—
  A Gyrostat Problem (*With Illustration*).—D. M'FARLANE . . . 385
  Origin of the Chesil Bank.—Col. GEORGE GREENWOOD 386
  Natural Phenomena in South America.—THOMAS R. R. STEBBING 386
  Volcanic Action in the Sandwich Islands—ISABELLA L. BIRD . . 386
  The Height of Waves.—Capt. WM. W. KIDDLE 386
OUR ASTRONOMICAL COLUMN:—
  Variable Stars 387
  Mars and 3 Sagittarii, 1875, June 29 387
  Encke's Comet 387
THE TRANSIT OF VENUS 387
THE PROGRESS OF THE TELEGRAPH, I. (*With Illustrations*) . . . 390
ON SOME REMARKABLE CHANGES PRODUCED IN IRON AND STEEL BY THE ACTION OF HYDROGEN AND ACIDS. BY W. H. JOHNSON, B.Sc. 393
THE SOUTHPORT AQUARIUM. By CHARLES E. DE RANCE 393
NOTES 394
SCIENTIFIC REPORT OF THE AUSTRO-HUNGARIAN NORTH POLAR EXPEDITION OF 1872-74, II. 396
PRIZES OFFERED BY THE BELGIAN ACADEMY 398
SOCIETIES AND ACADEMIES 398
BOOKS AND PAMPHLETS RECEIVED 400